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ABSTRACT

This study reviews the literature regarding the theoretical rationale for creating a computer-based school system simulation for educational leaders' use in problem solving and decision making. Like all social systems, educational systems are so complex that individuals are hard-pressed to consider all interrelated parts as a totality. A potentially powerful tool for understanding system totality is computer simulation, which combines theory, experiment, chaos, and compressed time and space in a microenvironment. Schools face many invisible, seemingly insoluble problems that are best viewed from a systems perspective. Using school simulation, educators can ask "what if" questions without getting into hot water politically, or creating nonintuitive outcomes. Researchers can test and analyze data and pre-pilot projects before spending time and money on research projects. Leadership training programs can use simulations to provide problem-based learning or hands-on experiences for future administrators. School systems simulation promises to help school leaders clarify complex problems, develop a common language for discussing possible solutions, show complex interrelationships among problems, pretest solutions, and develop successful reflexive and reflective types of behaviors. High-fidelity, computer-based simulations can be used in several skill areas to give administrators the ability to perform experiments on school system models. (Contains 17 references.) (MLH)

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School System Simulation:
An Effective Model For Educational Leaders

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Abstract

The purpose of this study was to review the literature regarding the theoretical rationale for creating a computer-based school system simulation to be used by educational leaders in problem-solving and decision-making.

The findings were based on the development of systems simulations after World War II and how these simulations have been a promising model available to educational leaders for over 35 years. Computer-based system simulations have been used in many areas of the military, science, business, government, and industry. One is necessary in education, too. Schools face many problems, seemingly insoluble or even invisible to educators, that need to be viewed and approached from a systems perspective. Current system simulations combine theory and experiment, along with time and space, to demonstrate how the whole of a system is greater than the sum of its parts.

Using school system simulation, educators will be able to ask "what if" questions without getting into hot water, politically. School leaders will be able to load their individual school data into the simulation and "trial run" ideas before they change the real world system. The school system simulation implies a more effective tool for managing instruction and school operations.

School System Simulation: An Effective Model for Educational Leaders

by Jorge O. Nelson

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It has been ten years since *A Nation At Risk* was published. Bell (1993) reports that school reform efforts during the last ten years have not been successful in meeting the needs of a changing American society. Educational leaders must find more effective ways to reform public education if the gap between what society desires and what education delivers is to be reduced.

Darling-Hammond (1993) and Kirst (1993) believe that the problem with educational reform is an excessive focus on specific areas within education, and an insufficient focus on the entire educational system. Lunenberg and Ornstein (1991) found that "one of the more useful concepts in understanding organizations is the idea that an organization is a system" (p. 17).

Educational systems, like all social systems, are of sufficient complexity that individuals have only a limited capacity to consider all interrelated parts as a totality. A potentially powerful tool for understanding the totality of systems is computer simulation (Hentschke, 1975; Richardson & Pugh, 1981; Senge, 1990; Richardson, 1991; Waldrop, 1992). Current system simulations combine theory, experiment, chaos, compressed time and space in a *microworld* (Senge, 1990) environment. This environment helps to demonstrate Fuller's (1975) concept of *synergy*, "the behavior of integral, aggregate, whole systems unpredicted by behaviors of any of their components or subassemblies of their components taken separately from the whole" (p. 3). Schools face many problems, seemingly insoluble or even invisible to educators, that need to be viewed and approached from a systems perspective. The lack of awareness of the synergy of a system contributes to the history of marginal and failed reform efforts.

Using school system simulation, educators can ask "what if" questions without getting into hot water politically or by creating non-intuitive outcomes. Researchers can test and analyze data, and "pre-pilot" projects before spending time and money on "real" research projects. Leadership training programs can use simulations in problem-based learning, where future administrators receive "hands-on" experience, guided by the faculty during debriefing sessions. School leaders can

load individual district or site-based school data into the simulation and "trial run" ideas before they attempt change in the real world system.[1] School boards can sit down with superintendents and plan how changes in policy will affect school districts before implementation. Principals can "test drive" site-based decisions to show educational teams if their actions have a predictable basis for meeting desired outcomes. Teachers will be able to "see" how planned curriculum changes affect the entire district before they invest time and money writing new or revised curriculum. Public education needs a way to "trial run" reform strategies before they are implemented, or the list of failed reform efforts will grow along with negative attitudes toward public education.

School systems simulation promises to help educational leaders in at least five areas: to help clarify complex problems; to give educational leaders a common language on which to discuss possible solutions to identified problems; to show the complex interrelationships between complex problems; to test solutions before they are implemented, thereby saving the school system from yet another failed reform effort; and to allow educators to develop successful reflexive and reflective types of behaviors.

Not all types of simulations promise to be successful in the evaluation of the educational leader's decision-making competencies. A growing body of research has indicated that *low fidelity* simulations (e.g., written management problems) are inappropriate for competence evaluation (e.g., Jones, Gerrity, & Earp, 1990; Swanson, Norcini, & Grosso, 1987). Education has been using these types of simulations for years (King, 1970). On the other hand, *high fidelity* computer-based simulations (e.g., flight simulators) are being used with great success for competence evaluation (Norman, 1993; Curry, Wergin, & Associates, 1993). The accuracy of high fidelity simulations make them virtually indistinguishable from real life to the typical user.

Meyers and Jones (1993) report seven skill areas in education that can be developed and practiced using high fidelity simulations: general skills (e.g. interviewing or nonverbal communication), specific skills (e.g., teacher observation), team skills (e.g., collective bargaining), problem-solving skills (e.g., a physics experiment), synthesizing skills (e.g., a management problem discussed in class, but not in the text), basic empathic skills (e.g., imagining the woes of

[1] At the time of this writing, the Office of Educational Research and Improvement (U.S. Department of Education) was in the final stages of publishing nationwide 1990 census data—cartographic and demographic—by school district. These CD-ROMs can be accessed in a computer simulation, saving the educator and researcher much time and money in initial data input.

a HIV-positive student), and advanced empathic skills (e.g., reversing roles of teachers and administrators in a collective bargaining simulation). Hass and Parkay's (1993) findings support the apparent benefit of increasing interpersonal skills between team members. In simulation sessions of the M-1 tank, the U. S. Army reported that, during simulated stressful conditions, groups of simulators were as useful for teaching teaming skills as they were for teaching the mechanics of tank operation.

High fidelity simulations can give school leaders the ability to perform experiments on school system models. School system simulations would be like flight simulators for policy—allowing educational leaders to practice crash-landing school reform measures without taking 250 million people along for the ride. No educational leader should make a reform decision without first proving their competence by spending time on a school system simulator, where they experience chaotic events (e.g., budget cutbacks, teacher strike, student violence, etc.) and even "crash" the reform—learning what *not* to do in the "real" world. The simulations would not even have to be terribly complicated, so long as they gave people a realistic feel for the way situations developed and for how the most important variables interact. Holland (cited in Waldrop, 1992) refers to one such "flight simulator" for city planners, *SimCity*, a simulation from the Maxis Company[2] of Orinda, California. "SimCity is one of the best examples I know of the flight simulator idea" (p. 267). He, and over one million others, went out and bought a copy.

High fidelity system simulations have been used as effective leadership tools in many areas of the military, science, business, government, and industry (Garove, Handley, & Stevens, 1975). Medicine is using high fidelity simulation to allow doctors to treat theoretical patients on their computer screens and to observe the results of their decisions (Curry, Wergin, & Associates, 1993). High fidelity system simulations are necessary in education, too. All factors for the initial development of a high fidelity school system simulation exercise are in place. It is time to begin developing school system simulations.

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[2]Maxis Business Division has gone on to produce *SimRefinery* for Chevron; *TeleSim* for Coopers & Lybrand; and *SimEnvironment* for Logistics Management Institute, an Environmental Protection Agency-sponsored, nonprofit research and consulting agency. In the works is *SimHealth*, a project, funded by the Merkle Foundation, that promises to help identify problems in the health care industry.

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